

UNCLASSIFIED

AD NUMBER	
AD136830	
CLASSIFICATION CHANGES	
TO:	unclassified
FROM:	restricted
LIMITATION CHANGES	
TO:	Approved for public release, distribution unlimited
FROM:	Distribution authorized to DoD only; Protection of Foreign Information; 1941. Other requests shall be referred to: Director, Exploiting Centere, United Kingdom.
AUTHORITY	
DoD Freedom of Info & Scty Review Ofc ltr, Ref: 98-M-0165/A1, 2 Jan 2000; Same	

THIS PAGE IS UNCLASSIFIED

UNCLASSIFIED



AD NUMBER

AD-136830

CLASSIFICATION CHANGES

TO

RESTRICTED

FROM

Confidential-Modified HANDLING

AUTHORITY

OCA

THIS PAGE IS UNCLASSIFIED

REPRODUCTION QUALITY NOTICE

This document is the best quality available. The copy furnished to DTIC contained pages that may have the following quality problems:

- **Pages smaller or larger than normal.**
- **Pages with background color or light colored printing.**
- **Pages with small type or poor printing; and or**
- **Pages with continuous tone material or color photographs.**

Due to various output media available these conditions may or may not cause poor legibility in the microfiche or hardcopy output you receive.

☐

If this block is checked, the copy furnished to DTIC contained pages with color printing, that when reproduced in Black and White, may change detail of the original copy.

AD 136830

Armed Services Technical Information Agency

Reproduced by

DOCUMENT SERVICE CENTER

KNOTT BUILDING, DAYTON, 2, OHIO

This document is the property of the United States Government. It is furnished for the duration of the contract and shall be returned when no longer required, or upon recall by ASTIA to the following address: Armed Services Technical Information Agency, Document Service Center, Knott Building, Dayton 2, Ohio.

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

**NOTICE: THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE
NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING
OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 and 794.
THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN
ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.**

AD NO. 136830

ASTIA FILE COPY

RESTRICTED

RECORD

2138

AMERICAN

136830

HALSTEAD EXPLOITING CENTRE

REPORT ON WORK IN CONNECTION WITH IMPULSE PROPULSION.

PANEL

Date 29 Aug 47

KW

PUBLICATION: BIOS / Gp. 2 HEC 1263 .

TRANSLATOR : Sgt. D. Redlich, W.A.A.F.

DEC 11

57AA

34840

Westfaelisch Anhaltische Sprengstoff-Aetier-Gesellschaft.

CHEM. FABRIKEN

Werk Reinsdorf

Report on work in connection with Impulse propulsion

Impulse Propulsion

On 3rd October 1940 the Research establishment of the Deutsche Waffen and Munitionsfabriken AG, Luebeck-Schlutup submitted a report made by Dr. Langweiler, referring to a proposal to increase the ballistic effect by using directional combustion of the charge (Impulse propulsion). Following this, experimental manufacture of propellant charges was started by WASAG.

In order to make it possible to start on the first practical experiment proving the theory in Dr. Langweiler report, our aim was to try and make the charges without taking into account whether they would be suitable for manufacture and to use at first nitro cellulose powder. The material of 0-600 m/sec burning velocity at a pressure of 3000 atm required to make the Langweiler theory possible, is not available in the present position of science. In order to achieve an effect to take the place of such a high burning velocity, it was planned to construct charges of nitro cellulose with a surface enlarged accordingly.

Propellant grains with a very large number of channels were chosen and it was agreed that the grains should have a diameter of 20 mm and 331 perforations of 0.2 mm. This would make the wall between the channels about 0.75 mm thick. Besides the fact it is almost impossible to make a matrix with 331 channels on a circular surface with a diameter of 2 cm the arrangement of the channels in the explosive composition containing

body could not be achieved. This point will be mentioned again later on. Therefore unfortunately the available installations, apparatus etc. proved unsuitable for manufacturing such propellants.

From several completed experiments for the manufacture of the propellant of question, so far only a purely hand-working method proved suitable. On principal the experiments were made only with completely dry tubular propellant with a diameter of about 0.95 mm and a channel diameter of 0.1 to 0.2 mm which were stuck together and made to propellant grain with the required dimensions.

The use of freshly pressed propellant tubes seems desirable, but proved not possible after the experiments were made. On compression of such propellant tubes, often perforations were squashed together, whilst hollows were formed when small pressure was used. It was also impossible to stick such tubes together and make one whole out of it, because the subsequent shrinking of such larger bodies causes a tension, which makes the joints tear apart.

Making of Multi-tubular grains

The dried tubular propellant sticks of 0.9 mm diameter are put in layers into the half of the cylindrically drilled shape which has a diameter of 22 mm after their surface has been covered with solvent so that the gaps are equalised using sufficient pressure (Illustration 1).

To check the regular geometrical make up of the grain tubes of different colours are used. Both halves of the shape filled with tubular sticks are then put together (Illustration 2) and united under pressure (Illustration 3) and are freed with the help of a vacuum at medium temperature from the adhering solvents within 8-10 days.

In order to control the uniform shrinking which occurs during the drying process and in order to compensate gradually the tension occurring after

WGC/1263/3

Further stretching appropriately dimensioned shapes are used. From the sticks produced in this way (Illustration 4) grains of 49.3 mm are cut out and lightly rubbed down to the required external diameter. Illustration 5 shows some of these grains.

The section of such a body (Illustration 6) shows the arrangement of the many channels. The longitudinal section of a propellant grain can be seen in illustration 7.

The grains made in this way were fired by the Research establishment of the DWM at Luebeck Schlutup, as there was at Reinsdorf neither a bomb nor a suitable barrel available at the time. A statement on the results achieved can be seen from a report by the DWM of the 1st March 1941 page 16. According to this it was found possible to keep the gas pressure of 0.4 - 0.5 mm approximately constant for at least a short time by using the multi tubular grain.

As is mentioned in the same report, the DWM made multi tubular grains also by hand methods using Reinsdorf "Polmasse" (Solventless Propellant) in tube and scroll form. The experiments were successful at least as regards burning even though the method of manufacturing the bodies might prove difficult.

The accuracy depends on the geometrical construction of the propellant which is the condition for their usefulness. Therefore it was the aim to eliminate the manual work and to use modern factory tools and methods. The maximum number of perforations in a grain pressed with the usual factory methods can amount to a circle with a diameter of approximately 2 mm with about 36 channels of 0.1 and 0.2 mm. Larger grains could either on the one hand not be fired within a short time sufficiently from the solvent or could not have the stresses eliminated. The making of the large multi tubular grains should therefore be achieved by a mechanical method.

HEC/1263/4

as the nucleus body ("Kern korper"). These tubes are fixed after damping with solvent onto the already dry nucleus body. Illustr. 8 and 9 show the finished nucleus body matrix in which the arrangement of the 36 drifts can be seen. In order to distribute the channels equally over the whole body, the construction of the nucleus and ring matrices is completed in accordance with the following 2 principles:

(a) The distribution of the channels is made on concentric part curves, the radius of which is always a multiple of 1.8 mm. The number of channels arranged on the part curves can be calculated from the part circle circumference and the required thickness of the wall between 2-channels of 0.75 mm (Illustration 10).

(b) Honey comb pattern.

With the exception of those situated on the circumference, the centres of the channels are always at a distance of 0.95 mm from each other (ill. 11).

Ballistic Examination

To test such projectiles made experimentally, it would be desirable if a firing apparatus could be made available at Reinsdorf. It is planned that such propellants should be fired in a bomb.

Therefore suitable pressure bombs for pressures up to a maximum of 10,000 atm were ordered at Messrs. Peters, Berlin. With regard to the construction of these special bombs several conferences were held in conjunction with the DWM in Berlin at J. Peters. Originally it was suggested by the DWM that the automatic sealing device by Peters can not only be used for the bomb fastening ("Bombenverschluß") but also for the sealing of the "stop-pistol" ("Stopfistole"). But since then experiments have

shown that the automatic sealing of the "stop-pistol" is not suitable

027324

HW/1263/5

cylinder. The automatic sealing of the bomb fastening head ("Bombenverschlusskopf") is to be constructed according to plans suggested by the D.M. which makes a separate fuze electrode unnecessary as is also the case with the normal method of construction by Peters in which the Buna disc used acts as protection against hot explosive gases on account of the pressure piston adapted to a vacuum.

As the shooting range specially constructed for that purpose at Ruinsdorf is expected to be completed shortly and the delivery of the bomb by Messrs. Peters is expected in the middle of May, the first bomb trials will take place in the near future.

Further questions.

Assuming the experiments with various multi-tubular grains are successful the following questions would arise:-

1. The technical manufacture of multi tubular grains out of a nitro-cellulose substances with or without explosive oil.
2. Ballistic examination of these multi-tubular grains in the pressure bomb.

From the results obtained from these experiments the way to be taken for the further development is to be decided.

Appendix

- 9 photographs (Illustration 1 - 9)
2 diagrams (Illustration 10 - 11)

227/315

HP 46/153/1

- Blatt 1 -

Zwischenräume ausgeglichen werden (Abb. 1).

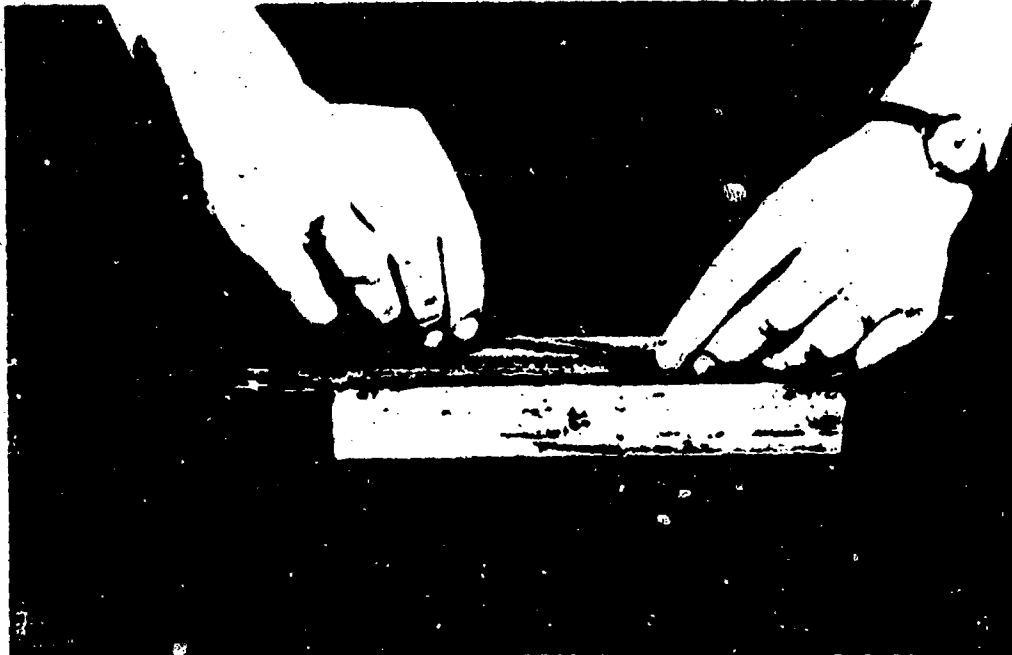
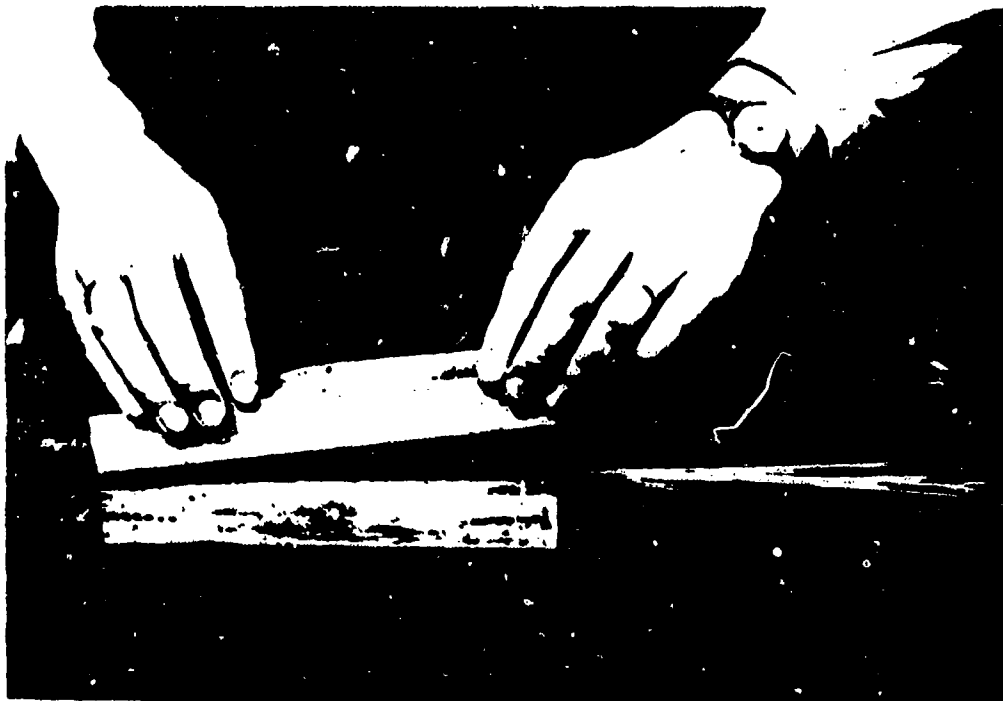


Abbildung 1.

027326

[illegible]

- 1145: 6 -

1127227

- Blatt 6 -

HT 46/153/3

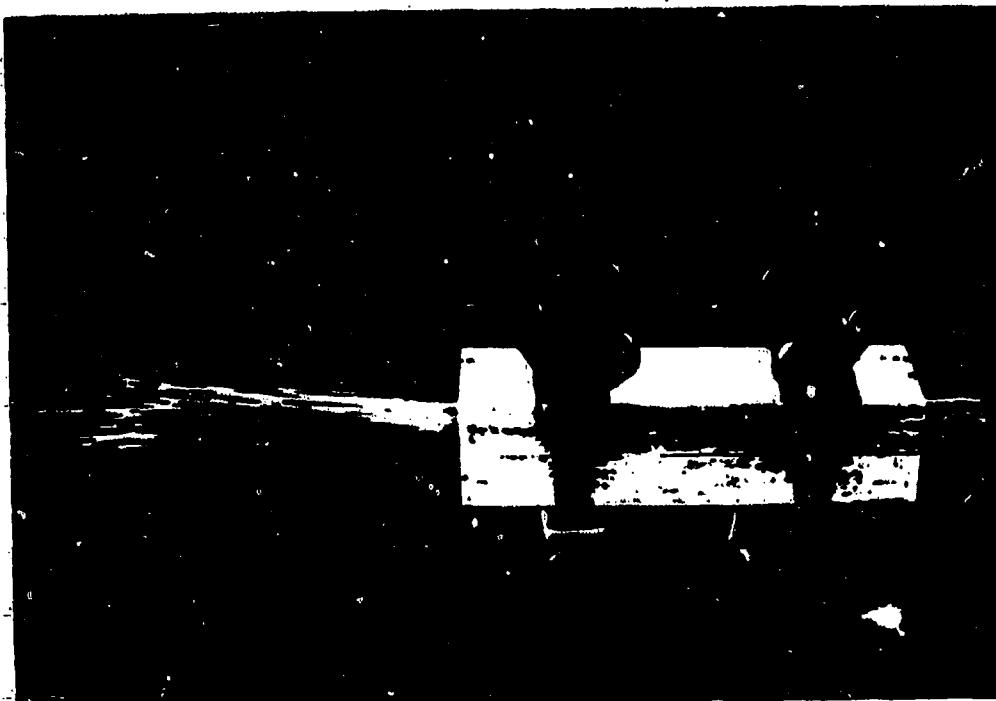


Abbildung 3.

- Blatt 7 -

HT 46/153/3

11.6.1949

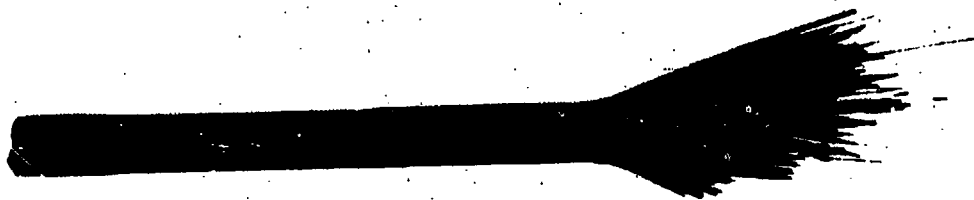


Abbildung 4.

027329

25

Der Querschnitt eines solchen Körpers (Abb. 6) zeigt die Anordnung der Vielkanäle.

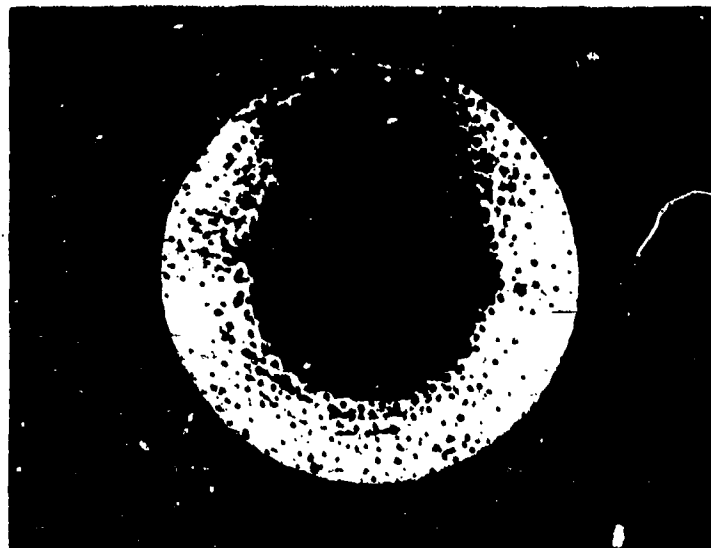


Abbildung 6.

Der Längsschnitt eines Pulverkörpers ist auf Abb.7
ersichtlich.-

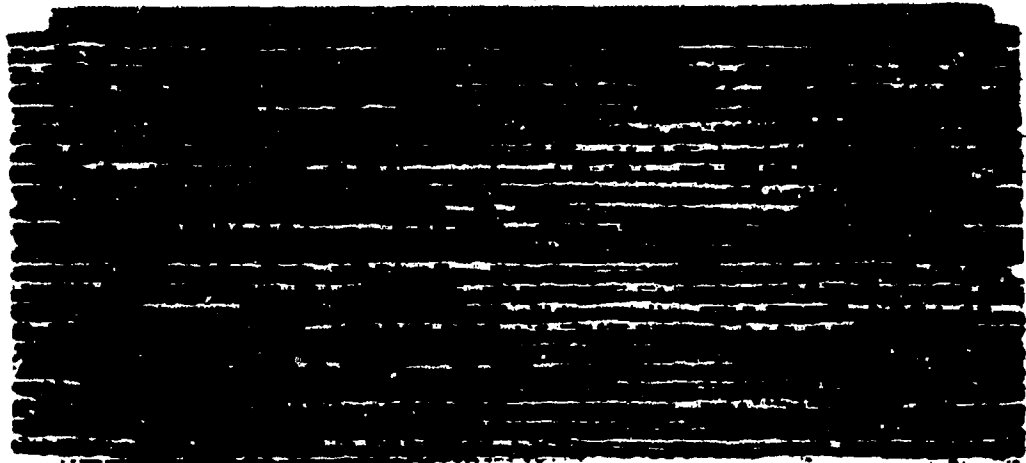


Abbildung 7.

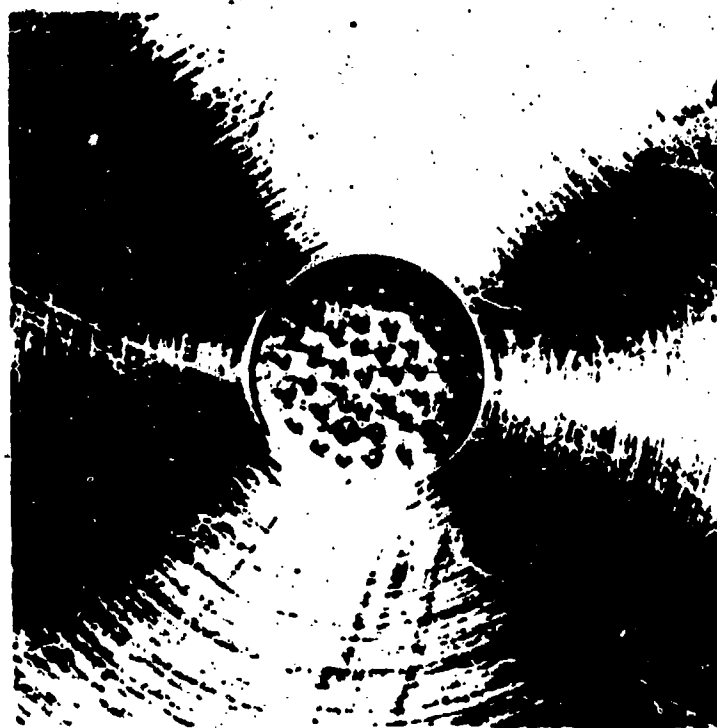


Abbildung 8.

U27333

46/153/9

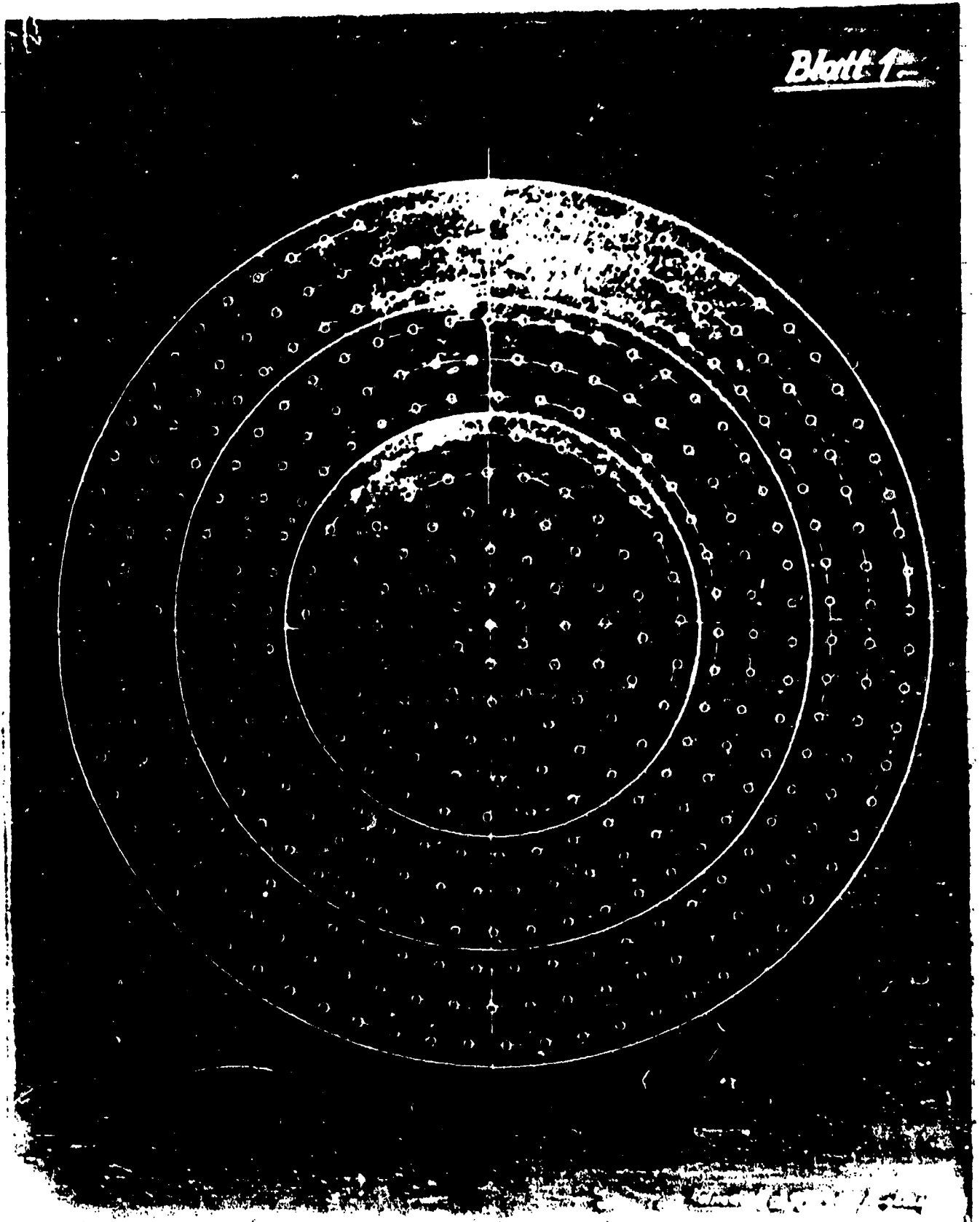
- 31038 15 -



Abbildung 9.

027354

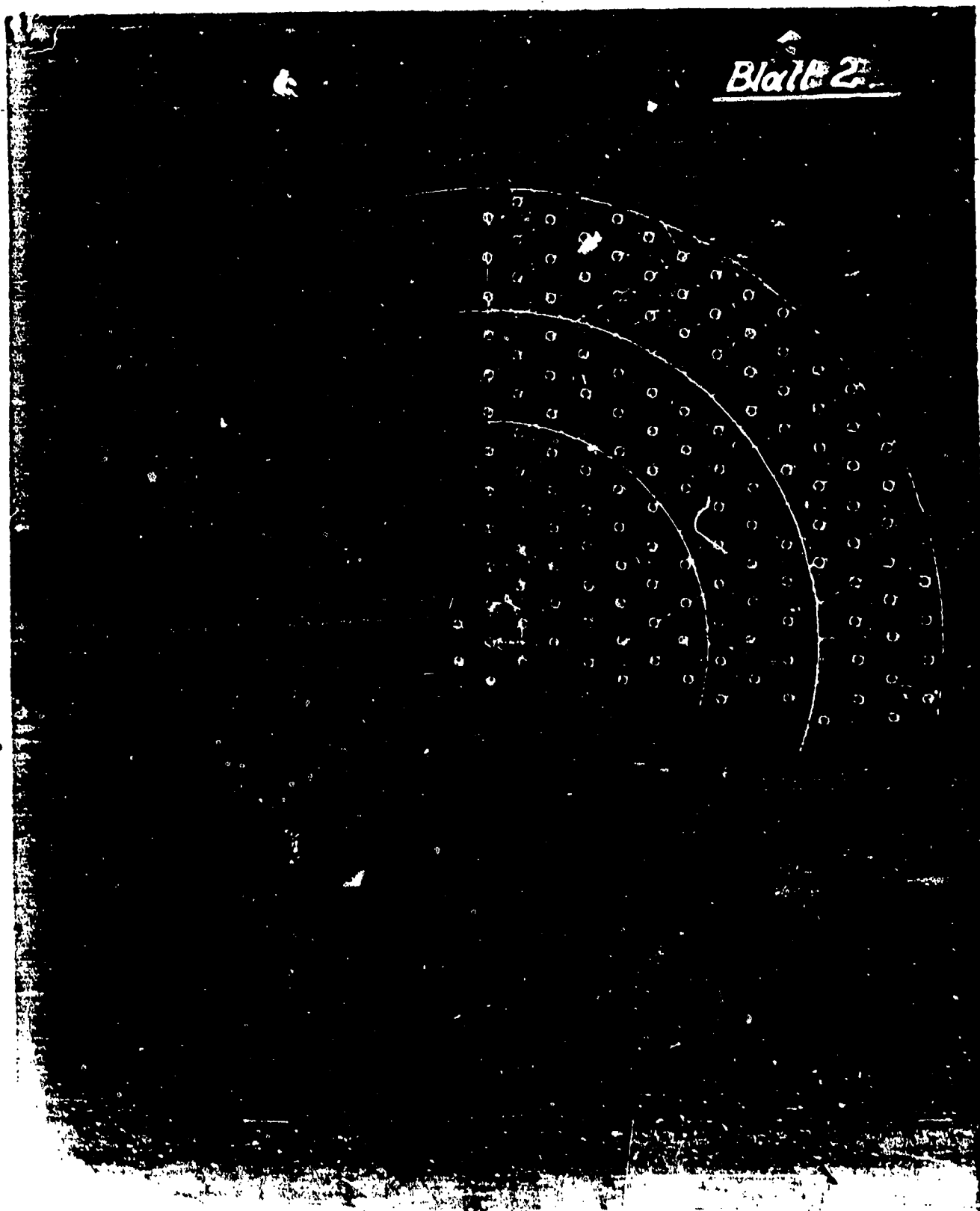
Blatt 1



- Blatt 18 -

HP 46/753/11

Blatt 2



Received 2/8/00



DEPARTMENT OF DEFENSE
DIRECTORATE FOR FREEDOM OF INFORMATION AND SECURITY REVIEW
1155 DEFENSE PENTAGON
WASHINGTON, DC 20301-1155

2 JAN 2000

Ref: 98-M-0165/A1

[REDACTED]

This refers to our letter to you dated October 7, 1999, regarding your appeal to the Information Security Oversight Office for 14 documents previously requested under Mandatory Declassification Review procedures. One document (AD346727) was provided to you by our letter dated November 19, 1999.

The review of 11 British documents you requested is complete and there are no objections to release. Titles of these documents are contained on the enclosed sheet and a copy of each is enclosed. We will advise you as soon as the reviews of the remaining two documents are completed.

*Per DoD letter,
Please mark these 11
documents "available
to the public."*

Sincerely,

SIGNED

H. J. McIntyre
Director

AD-036799
AD-044992
AD-048643
AD-057151
AD-057524
AD-057525
AD-057526
AD-057527
AD-122495
AD-136830
AD-139544

*I verified the docs
could be marked
available for public
release via telecon
with Pat Skinner,
DoD Security Review,
695-9556/6428 on
21 Jan 2000.*



*Kelly Akers
DTIC-RS*



Received 2/8/2000